Is the islamic equity market independent of the influence of primary commodities ? Malaysian evidence

Lajis, Siti and Masih, Mansur

INCEIF, Malaysia, Business School, Universiti Kuala Lumpur, Kuala Lumpur, Malaysia

30 June 2018

Is the islamic equity market independent of the influence of primary commodities ? Malaysian evidence

Siti Lajis[1] and Mansur Masih[2]

Abstract

This paper is an attempt to test the influence of commodities such as, the primary export commodities on the Islamic equity market. Malaysia is taken as a case study. The standard time series techniques are used for the analysis. The results tend to indicate that the Islamic equity market is exogenous, i.e., it is independent of the influence of commodities.. This finding appears to be a bit counter-intuitive in that the Islamic equity is expected to be closely linked with the real sector, represented by its endogeneity vis-à-vis the selected commodity variables. Based on this, the study confirms the perception that Islamic equity is a subset market of the conventional capital market. The empirical analysis tends to suggest that policy measures and structural reforms may be initiated in order to avoid financialization and decoupling of the Islamic equity market from the real sector, as in the case of conventional equity market.

Key words: Islamic Equity, Commodities, VECM, VDC, Malaysia

---

[1] INCEIF, Lorong Universiti A, 59100 Kuala Lumpur, Malaysia.

2 **Corresponding author**, Senior Professor, UniKL Business School, 50300, Kuala Lumpur, Malaysia.

Email: mansurmasih@unikl.edu.my

1.0. Introduction

A sharp increase in the popularity of commodity in the last decades has invited a plethora of studies on the behaviour of commodity price. According to a staff report from the U.S. Commodity Futures Trading Commission, the total value of various commodity index-related instruments purchased by institutional investors increased more than 10 fold from an estimated $15 billion in 2003 to at least $200 billion in mid-2008 (CFTC, 2008 as quoted in Tang and Xiong, 2012). Similarly, the Institute of International Finance (2011) as quoted in UNCTAD (2012) reported a significant increase of commodity assets from less than $1 billion around the end of the last century to a record high of $450 billion in April 2011. This would lead us to wonder whether this sharp increase in investor appetite for commodities has had a significant impact on the equity market and if it is, would this be a long term phenomenon.

One view argues that commodities and equities do not move in sync because risk factors that explain the cross sectional variations in equity returns have historically had no forecasting power in commodity markets. Another view, however argues that the entrance of new kinds of market participants, namely the hedge funds and swap dealers has resulted in the heightened interests in commodities as an avenue for balancing exposures in the financial assets.

From the financial system's stability perspective, an increased participation of financial institutions as investors or hedgers in the commodity market is considered as a positive development, as it implies that the financial sector is becoming more interlinked with the real economic sector. This development is indeed in line with the recent rethinking amongst the policy makers particularly the central bankers for the financial system to go back to basics – to serve the real economy, with its main purpose to match the savings and investments for generating economic growth.

Along the same line, Islamic capital market which upholds the universal virtues of strong governance, transparency and disclosure, arguably has all the ingredients and potential to serve the needs of the economy. However, there is almost non-existent research on the relationship between Islamic capital market and commodities. This paper, thus, is a humble attempt to fill this gap, examining the relationships between the FTSE Bursa Emas Shariah Index and selected commodities of Malaysia.

1.2. Research Questions

The core proposition of Islamic finance draws on its inherent features and the values that it brings in supporting sustainable economic growth and in safeguarding financial stability. Since the Shariah ruling dictates that all financial transactions must be supported by underlying productive activities, the activities in the Islamic stock market too must therefore be closely linked with the real economy, hence implying its cointegrating relationship with commodities. Additionally, the importance of commodities in a investment portfolio as a hedging tool is also recognized. Based on these two premises, this study attempts to seek empirical evidence on the following questions:

1. Do commodities and Islamic stock index move together over time?

2. Which of the commodities is more influential in explaining the islamic stock price, thus is an effective hedger?

1.3. Research Objectives and Motivation

In the light of the above premises and the significant attention of both practitioners and academia towards the behaviour of commodities, in particular Rubber, Crude Oil, Palm Oil, Cocoa, Natural Gas, Tin, Palm Olein, and Latex, this paper intends to contribute towards a greater understanding of the impact of commodities to the Shariah compliant stock prices, through:

1. Analyzing the co-movement between the commodities and Islamic stocks; and

2. Analyzing both relative- and absolute-causality relationships between the commodities and Islamic stocks.

2.0. Literature Review

The linkage between assets and commodity markets has become an important topic of debate in the literature in recent years. In a recent paper, Rossi (2012) studied the linkage between equity and commodity markets, focusing in particular on studying its evolution over time. The study found that the global commodity price indices are positively correlated with lagged equity values, the time series properties of commodity prices have however drastically changed since the 2000s, and

commodity prices have become more correlated with equity markets around the same time. Interestingly, Rossi (2012) also found that the country-specific equity markets do Granger-cause country-specific commodity price indices. This finding therefore implies that the rapid growth of commodity investment precipitated a fundamental process of financialization among commodity markets. This observation does corroborate with the study by Rey (2009) who asserted suggestive evidence for Australian, Canadian, and Chilean stock price indices, to have the predictive ability for commodity price indices.

In addition to that, Tang and Xiong (2012) had recently empirically evidenced that there is indeed fundamental financialization of the commodity markets in the United States market. Employing commodity futures and indices as well as deploying rolling regression analysis, Tang and Xiong (2012) have found that the price of an individual commodity is no longer determined solely by its supply and demand, but rather determined solely by the aggregate risk apetite for financial assets and investment behaviour of diversified commodity investors. More importantly, they further suggested that this fundamental change would be likely to persist, which confirms the effect of the financialisation on the commodity sector driven by speculative activities.

However, from the investors' perspective, the above findings would imply that the merits of commodity as a good hedger against the investment risk of equity assets and as an effective risk diversification instrument. Buyuksahin, Haigh, and Robe (2008) showed a lack of greater return co-movement across equities and commodities through a dynamic conditional correlation (DCC) and Johansen and Juselius co-integration techniques. The empirical finding suggests a plausible interpretation that the relation between the returns on investable commodity and U.S. equity indices has not changed significantly and no evidence of co-movement between commodity and equity price during extreme events. Guhathakurta *et.al.*(2013) compared the correlation of equity and commodity markets between developed market (sample taken is the U.S.) and developing market (the sample is Indian market) and found that the time-varying movement of Indian stock and commodity exchanges are much similar for Indian market while those of the U.S. are different. Thus, this suggests that commodity can still be employed for portfolio diversification of passive investors in the developed market, and not in the developing.

The issue of long-run cointegration is relevant for institutional investors. Cointegration signifies that the prices of commodity and equity investment are converged, either in the short nor long-term. Converging in the prices of assets implies a strong co-movement of that asset classes which is unfavourable to investors since fall in price of one asset could lead to fall in price of its correlated assets. It is often viewed that prices between class of assets would not be diverged in the short-term,

hence placing speculators and short-term investors in a safest position than institutional and long-term investors. Due to this axiom, investors are less interested in investing into a correlated asset class since it reduces their diversification's benefits.

Against this backdrop, only very few studies can be found in trying to understand the structural relationship between commodity and equity or other asset class for Malaysian market. Thus far, most studies mainly focused on the U.S. market uncovering the structural linkage between equity and commodity, perhaps due to its state of advancement vis-à-vis other jurisdictions. Of these, there is only one literature that attempted a study on the dynamics of Islamic capital market sphere, particularly in establishing the relationship between the Islamic equity and commodity market. Studies about equity market in Malaysia by Yusuf and Abd Rahman (2013), Saad *et.al.* (2013), Ong *et.al.* (2012), Hussin *et.al.* (2012), and Abdul Hadi *et.al.* (2011), however, are found to be quite related to our study but only to a limited extent as they focused on the conventional stock markets.

Yusuf and Abd Rahman (2013) examined the Granger causality effect between Malaysian equity market and exchange rate volatility. Using Granger causality and GARCH Model, Yusuf and Abd Rahman (2013) found that there was a feedback interaction between Malaysia equity market and exchange rate volatility, hence suggesting the government to be cautious in their policy accordingly. Feedback interaction here means that there was a bi-directional Granger causality between equity market and exchange rate volatility in the overall market. Saad *et.al.* (2013) investigates the performance of Futures Crude Palm Oil (FCPO) and Crude Palm Kernel Oil futures (CPKO) in Malaysian commodity futures market and it is revealed by regression and T-test that the prices and volume of trading for FCPO performed better in comparison with CPKO. Slightly earlier, Abdul Hadi (2011) undertook a similar research, examining the effect of changes in crude palm oil prices of Malaysian commodity market on the price of crude oil as proxied by West Texas Intermediate (WTI). Using Engle-Granger Cointegration test and Error Correction Model (ECM), it is found that there is a significant long-term co-movement and positive correlation between the prices of crude palm oil (CPO) and petroleum crude oil (COP). Additionally, Ong *et.al.* (2012) investigates the hedging effectiveness of crude palm oil futures market in Malaysia and found that the spot price of crude palm oil in Malaysia is relatively stable and consistent over the period. This finding suggests an insight for investors that Malaysia FCPO futures market does offer the merits of hedging to the conventional investors.

In view of this, this study tries to contribute in a small way in finding empirical evidence on the dynamics of Islamic capital market in Malaysia, by analysing the cointegrating and Granger-causality relationships between the primary commodities of Malaysia (Rubber, Crude Oil, Palm Oil, Cocoa, Natural Gas, Tin, Palm Olein, and Latex), and the Islamic equity market proxied by FTSE Bursa

Emas Shariah Index. Applying the Johansen MLE cointegration and Granger-causality tests (VECM and VDC), the study hopes to be able to answer the aforementioned research questions.

3.0. Methodology of Research

3.1. Research Methods

To derive empirical evidences to answer the research questions, time series technique is then applied. Time series technique assumption is known to be more realistic than the Ordinary Least-Square assumptions, hence improving the result for this research. This method is preferred because the starting point is to exploit the information that one can get from a variable that is available through the variable itself (Asteriou and Hall, 2007). Amongst others, one essential shortcoming of time series predecessor, that is OLS regression method, is the assumption of stationary variables, which renders the model as mis-specified. Notwithstanding that, time series approach is pursued where Johansen MLE cointegration is employed in order to allow the researcher to test long-run theoretical relationships amongst the variables, and Engle-Granger causality test, which allows the researcher to derive the causality relationship amongst the variables.

To begin, unit-root test is conducted so as to see whether the variables are stationary or not. As asserted by Brooks (2008), formal test for non-stationary identification is essential due to three reasons, that are; (1) the stationarity or non-stationarity of a time series can strongly influence its behaviour and properties, (2) the use of non-stationary data can lead to spurious regressions, and lastly (3) non-stationary variables will result in invalid assumption for asymptotic analysis, i.e. "t-ratios" will not follow a t-distribution, and F-statistic will not follow an F-distribution. A variable is also said to be integrated at the order of *d,* thus I(*d*), if it requires differencing at horizon *d* to achieve its stationarity. Hence, it is our objective to have I(1), that is the variables are stationary in the first-differenced form before proceeding to order of VAR determination in the step 2.

In the step 3, Johansen MLE cointegration test is adopted. Arguably, Johansen approach is more useful in providing insights to policy makers, as it allows the test result to accommodate more than one cointegrating vectors. The other approach, that is the Engle-Granger cointegration test, would only suggest the existence of one cointegrating vector as it deploys the error-term (residuals). Having established the number of cointegrating vectors, Long Run Structural Modelling (henceforth, LRSM) is subsequently undertaken. The objective of LRSM is to derive theoretical meaningful long-run cointegrating relations amongst the variables. It is worth to note that LRSM requires normalization of the expected dependent variable, as well as tests the underlying economic theory. At this stage, the researcher would be able to establish inferences which of the variables that are cointegrated in the

long-run. Deriving on the outcome of LRSM exercise, it is hoped that the above mentioned research question one will be answered.

Subsequently, in order to achieve the second research objective (that is, knowing the relative- and absolute- causality relationships between the commodities and Islamic stock index), vector error-correction model (henceforth, VECM) and variance decomposition (VDC) tests are employed. VECM result would provide information on the absolute causality relations through error correction model, while VDC allows us to understand the relative causality relations through decomposing variance throughout horizons. Additionally, a graphical visualization of the relationship in the VDC is provided in the Impulse Response Function (henceforth, IRF) and the test is concluded by the PP graph which helps to visualize the dynamic response path of the effects of a system-wide shock. It is worth noting that the difference between IRF and PP graphs is that the latter traces out the effects of a system-wide shock while the earlier does not. To this end, PP graph provides the information of the duration that the variables take to stabilize themselves (returning to equilibrium), had external shock affected the model.

3.2. Data

This study samples monthly data of eight commodities traded in the Bursa Malaysia commodities trading and FTSE Bursa Emas Shariah Stock Index for 72 observations starting from period of April 2007. The eight commodities are: Natural Gas (LNG), Tin, Cocoa, Palm Olein, Palm Oil, Crude Oil, Rubber, and Latex. The rationale for sampling these commodities is based on the view that these are the "primary export commodities" of Malaysia. It is also noted that all commodities are obtained in the price form, except for Natural Gas (LNG) which is attained in price index form published by London commodity market. This alternative measure was undertaken in view that the some of the data points for the LNG were missing. In addition to that, the FTSE Bursa Emas *Shari'ah* price index is viewed to be a good proxy for Islamic stocks performance.

4.0. Results and Discussion

4.1. Cointegration Test

STEP 1: UNIT ROOT TEST

Before embarking on the Vector Auto Regression (VAR) model for cointegration test, an important step is to ensure that the series used are indeed I(1), where the variables used are non-stationary in 'level' form and stationary in 'differenced' form. Having I(1) series indicates that the variables contain the trend or theoretical component. The stationarity or non-stationarity of a variable can strongly influence its behaviour and properties. When a variable is stationary, shocks to the variable will gradually die away, while the persistence of shocks to non-stationary variable will be infinite.

To establish if the variables are I(1), we run unit root test by applying the Augmented Dickey Fuller (ADF) and Phillips Perron (PP) tests on the level and differenced forms of the variables to examine their stationarity at each level. Using ADF would address autocorrelation problem prevalent in time series data, while PP addresses both autocorrelation and heteroskasticity problems by using Newey-West adjusted-variance method.

Table 1: ADF Unit Root Test Results

	Variables	**Test-Statistic**	**ADF C.V.**	**Implication**
Level Form				
Intercept and a trend	LEI	-2.2275	-3.4769	Non-stationary
	LRUB	-2.0463	-3.4769	Non-stationary
	LCO	-3.2368	-3.4769	Non-stationary
	LPOIL	-2.2489	-3.4769	Non-stationary
	LCOCO	-1.1795	-3.4769	Non-stationary
	LLNG	-2.3904	-3.4769	Non-stationary
	LTIN	-2.4693	-3.4769	Non-stationary
	LPOLEIN	-2.7273	-3.4769	Non-stationary
	LLATEX	-2.0159	-3.4769	Non-stationary
First-differenced Form				
Intercept but not a trend	DLEI	-4.3990	-2.9055	Stationary
	DLRUB	-3.5386	-2.9055	Stationary
	DLCO	-4.0038	-2.9055	Stationary
	DLPOIL	-4.6530	-2.9055	Stationary
	DLCOCO	-4.3567	-2.9055	Stationary
	DLLNG	-6.0722	-2.9055	Stationary
	DLTIN	-7.7845	-2.9055	Stationary
	DLPOLEIN	-4.2816	-2.9055	Stationary
	DLLATEX	-4.1910	-2.9055	Stationary

Source: Processed Data

Firstly, the ADF test is conducted on all variables in their level and differenced forms, where the null hypothesis is the tested variable to be non-stationary. The test statistic of the ADF regression order is selected, based on the highest computed values of the AIC and SBC, and then compared with the 95% critical value. The null is rejected when the test statistic exceeds the critical value thus revealing a variable as stationary. The results of the ADF test exercise on all variables are summarized in Table 1.

From the results tabulated above, all variables provide favourable outcome for us to proceed to the next step as all the variables meet the I(1) objective. To ensure the robustness of our model, we also test the variables using PP test and found the following outcome as summarized in Table 2.

Table 2: Phillips Perron Unit Root Test Results

	Variables	**T-Ratio**	**P-value**	**Implication**
Level Form				
	ΔLEI	-74339	.460*	Non-stationary
	ΔLRUB	-1.4455	.153*	Non-stationary
	ΔLCO	-1.6637	.101*	Non-stationary
	ΔLPOIL	-1.7338	.087**	Non-stationary
	ΔLCOCO	-2.2472	.028**	Non-stationary
	ΔLLNG	-2.7188	.008	Stationary
	ΔLTIN	-1.8434	.070**	Non-stationary
	ΔLPOLEIN	-1.7155	.091**	Non-stationary
	ΔLLATEX	-1.5848	.118*	Non-stationary
Differenced Form				
	ΔDLEI	-7.4710	.000	Stationary
	ΔDLRUB	-7.6539	.000	Stationary
	ΔDLCO	-6.0628	.000	Stationary
	ΔDLPOIL	-6.0438	.000	Stationary
	ΔDLCOCO	-7.6696	.000	Stationary
	ΔDLLNG	-9.0523	.000	Stationary
	ΔDLTIN	-11.8484	.000	Stationary
	ΔDLPOLEIN	-5.3514	.000	Stationary
	ΔDLLATEX	-8.8925	.000	Stationary

*significant at 10%

** significant at 5%

*** significant at 1%

Source: Processed Data

It is interesting to note that compared to the outcome of ADF test, PP test shows that LLNG turned out to be stationary. It could be due to the attribute of PP test which corrects heteroscedasticity problem, hence resulting in the LLNG variable to be stationary at level form. However, it should be noted that this would not be an issue to our data because ADF

has shown that LLNG is non-stationary at level form, hence the deployment of PP test here is a mere experiment.

Implication for policy making at this juncture: The result in Step I informs the condition of the tested variables, that is whether or not they are 'non-stationary' (where a non-stationary series has an infinite variance (it grows over time), shocks are permanent (on the series and its autocorrelations tend to be unity) or 'stationary' (where a stationary series has a mean (to which it tends to return), a finite variance, shocks are transitory (autocorrelation coefficients die out as the number of lags grow). This information is pertinent since policy makers are interested to have the best variables which reflect the real situation in the market in order to formulate the closest model to facilitate effective decision making. In our case, it is shown that all variables are I(1) implying that supply side policies are more likely to be effective.

STEP 2: ORDER LAG SELECTION

Step 2 essentially is to check at which lag order are the series moving together. In order to determine the optimal lag order of VAR, we refer to the recommended order from the maximum estimates of the Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC), keeping in mind that a lower VAR order is often associated with the problem of serial correlation, while a higher VAR may risk over-parameterisation in a small sample. Prof. Pesaran in his Tutorial Lesson Manual in pages 292-293 suggested choosing the highest value of AIC and SBC with significant adjusted LR test result (> .000). Adjusted LR result = .000 implies that at this lag order, there is no co-movement in the long run.

AIC and SBC tests suggested different order of lag, i.e. AIC proposed order of 5 and SBC proposed order of 2. In view that the number of observations under study is rather small, i.e. 73, we could not take the risk of over-parameterization. As such, we proceed with the lag order of 2.

Table 3: Selecting the Order of VAR model

Order	AIC	SBC	Adjusted LR test
5	755.3074	302.0489	94.1828[.150]
2	703.3649	516.1494	192.4970[1.00]

STEP 3: COINTEGRATION

Under this stage, there are two integration tests applied, namely the Johansen ML cointegration test and the Engel-Granger residual-based approach.

a. Johansen ML cointegration test

After examining the unit root tests and the order of the VAR, the Johansen ML cointegration test is applied to ascertain whether there is a theoretical relationship among the variables and that they are in equilibrium in the long run.

Table 4 below tabulates the Maximum Eigenvalue and Trace of the stochastic matrix indicating the number of cointegrating vectors available. The null hypothesis is rejected when the test statistic exceeds the 95% critical value. The criteria of AIC, SBC and HQC are also compared to see the number of cointegrating vectors among our variables.

Table 4: Maximum Eigenvalue and Trace tests

	Null	**Alternative**	**Statistic**	**95%**	**90%**
Maximum Eigenvalue	R = 0	r = 1	64.2644	61.2700	58.0900
	R <= 1	r = 2	51.0107	55.1400	52.0800
	R <= 2	r = 3	38.4857	49.3200	46.5400
Trace	R = 0	r = 1	274.0368	222.6200	215.8700
	R <= 1	r = 2	209.7724	182.9900	176.9200
	R <= 2	r = 3	158.7616	147.2700	141.8200
	R <= 3	r = 4	120.2760	115.8500	110.6000
	R <= 4	r = 5	85.2660	87.1700	82.8800

From Table 4 above, we note the conflicting results of Maximum Eigenvalue and Trace of the stochastic matrix which indicate that the null cannot be rejected at r <= 1 and at r <= 4 respectively. Prof. Pesaran in his Microfit Manual (page 295) suggested that when there are conflicting results, then we should rely on economic explanations. In this regard, we proceed to the next step using the number of cointegration vector to 1. The reason for choosing 1 instead of 4 is because our main focus is to discern the cointegration relationship between the FTSE Bursa Emas Shari'ah index with the commodities available in Malaysian market, for Hedging/Investment Diversification purposes.

Cointegration implies that the relationship among the variables is not spurious, i.e. there is a theoretical relationship among the variables and that they are in equilibrium in the long run. Cointegration implies that each variable contains information for the prediction of other variables. At this stage, the evidence of cointegration may suggest the following potential interpretations:-

- Implications for portfolio diversification by the investors.
- In a cointegrated market, the possibility of gaining abnormal profits in the long term through diversifying investment portfolio is very limited.
- Implications for the extent of effectiveness of a government's short run monetary, fiscal and exchange rate stabilisation policies.

Based on our findings, the policy implication at this juncture perhaps is for the Malaysian government to consider devising possible policies or incentives that will effectively influence the endogenous variables, to be discerned in the next step.

b. Engel-Granger residual-based approach

In addition to the Johansen ML cointegration test, we have also applied the Engel-Granger residual-based approach (EG) to find non-spurious relationship amongst the examined variables. EG test considers seven asymptotically valid, residual-based test statistics for testing the null hypothesis of non-cointegration against the alternative of cointegration (Engel and Granger, 1987). Therefore, EG test could not make inferences for more than 1 cointegration. However, our result indicates no conclusive answer as the critical value for the Dickey-Fuller statistic gives a value of *NONE* for all the variables tested.

Moreover, based on the Microfit Manual in page 298, EG test is useful when a time-series data set needs to include dummy variables which possibly alter the critical values for unit root test. Considering that the examined data set does not include dummy variable, hence, the application of Engel-Granger residual-based approach is an academic attempt.

STEP 4: LONG RUN STRUCTURAL MODELLING (LRSM)

In this step, the objective is to estimate theoretically meaningful long-run relationship through exact identification and over-identification based on expected theoretical value and information that is available in the underlying theory.

In this endeavour, we normalised the variable of interest, i.e. the FTSE Bursa Emas Shariah Index (LEI) by assigning a coefficient of 1. Panel A of Table B tabulates

the result of exact identification where we see all variables to be insignificant. This "significance or insignificance" implications are determined through the T-ratio of each variable (Coefficient/standard error of variable). A variable is significant if its T-ratio is more than 2, and it is insignificant if the T-ratio indicates otherwise.

Table 5: Exact (Panel A) and Over-identifying (Panel B) restrictions on the cointegrating vector

	Panel A		**Panel B**	
	Coefficient	**(Std Error)**	**Coefficient**	**(Std Error)**
LEI	1.000	*NONE*	1.000	*NONE*
LRUB	2.2629	2.0101	1.3796	.67515*
LCO	-1.3220	1.0392	-.75152	.27689*
LPOIL	-3.8392	3.2824	-1.6152	1.2296
LCOCO	-.33704	.56979	.040055	.15359
LLNG	-.34921	.47412	.0000	*NONE*
LTIN	-1.7158	1.5785	-.92892	.45256*
LPOLEIN	5.6347	4.6550	2.3960	1.0528*
LLATEX	-2.4469	2.1761	-1.7042	.88447*
Trend	.027879	.031802	.0086232	.0058538
Log-Likelihood	889.9530		888.8087	
Chi-Square			.130	

* significant (T-ratio > 2)

This finding is counter-intuitive based on theoretical foundation, where it is theorised that commodities do have influence on stock market. As such, we proceed with over-identification procedure by imposing zero value as the coefficient to LLNG. This is in view of the attribute of LLNG which is based on price index whereas all the other commodities are in their actual market prices.

As depicted in Panel B, our over-identification result indicates that most of the variables except for LPOIL and LCOCO are now significant (indicated by *). Notwithstanding this, the Chi-Square value is greater than 10% threshold, implying that the restriction imposed is incorrect. Perhaps this observation intuitively indicates that LLNG does contribute to the model. In addition, the insignificance of estimator of LPOIL and LCOCO need not imply that these commodities are not useful for diversification. In fact, this empirical evidence infers that these commodities are not moving together with Islamic equity in the long-run, thus suggesting a potential diversification benefit for long-term investors. From the above analysis, we arrive at the following cointegrating equation (number in parentheses are standard deviations):

LEI + 1.38*LRUB - .75*LCO - .93*LTIN + 2.4*LPOLEIN – 1.7LLATEX → I(0)

(.675) (.277) (.452) (1.053) (.884)

Recall that this exercise is to examine the influence of commodities over the FTSE Bursa Emas Shariah Index. The above finding suggests that there is indeed co-movement between FTSE Bursa Emas Shariah index and most of the selected commodities (that is Rubber, Crude Oil, Tin, Palm Olein, and Latex) excluding LPOIL and LCOCO. This observation therefore confirms our earlier proposition that the Islamic equities are strongly linked with the real sector. However, the strong link is limited to only the commodities that statistically significant.

This finding would potentially offer the policy makers, particularly the financial regulator, to monitor closely the development of the Islamic equity market so as the pace of its development does not out-grow the advancement of the real sector; in this instance is the respective commodities market. Such proper planning is essential in order to avoid financialization of the Islamic equity market in Malaysia as what has happened in the conventional sphere. This policy decision is indeed paramount to ensure the sanctity of Islamic principles is upheld and preserved in all the activities in the Islamic equity market. As empirically evidenced from this humble study, perhaps another possible policy implication to the regulators of the Islamic financial sector is the need to revisit the use of Palm Oil as one of the main underlying commodities in the Malaysia's *Bursa Suq Al-Sila* (Islamic liquidity market), in view of its insignificance (besides Cocoa) in the above LRSM exercise.

Notwithstanding the above, this finding may infer a favorable policy implication to the conventional investors, in that the best commodities for portfolio diversification are in fact Palm Oil and Cocoa.

4.2. Causality Test

STEP 5: Vector Error Correction Model (VECM)

We have thus far deduced that indeed cointegration exists between FTSE Bursa Emas Shariah index and the selected commodities. However, step four does not tell which of the variables is leading and which one is lagging in the relationship. Hence, VECM technique is used to distinguish the absolute exogeneity of those cointegrated variables, the information of which would facilitate the policy makers' planning and decision making.

Table 6: VECM estimated by OLS based on cointegrating VAR (2)

	ΔLEI	ΔLRUB	ΔLCO	ΔLPOIL	ΔLCOCO	ΔLLNG	ΔLTIN	ΔPOLEIN	ΔLLATEX
ECM(-1)	1.1800 [.243] [x]	3.9759 [.000] [d]	3.9723 [.000] [d]	.85117 [.398] [x]	-1.0017 [.321] [x]	2.8583 [.006] [d]	1.7278 [.089]* [d]	.65463 [.515] [x]	4.9271 [.000] [d]
Chi-Sq SC(1)	4.2807 [.039]	.013672 [.907]	2.3098 [.129]	1.4397 [.230]	.0026017 [.959]	1.0072 [.316]	1.8832 [.170]	.64985 [.420]	.61052 [.435]
Chi-Sq F(1)	1.0517 [.305]	15.8032 [.000]	14.0745 [.000]	8.8510 [.003]	2.2504 [.134]	.57063 [.450]	4.5558 [.033]	3.1393 [.076]	18.4271 [.000]
Chi-Sq N(2)	37.5231 [.000]	4.3892 [.111]	1.1061 [.575]	43.5256 [.000]	18.0488 [.000]	12.8044 [.002]	11.5296 [.003]	3.3142 [.191]	10.2166 [.006]
Chi-Sq HET(1)	4.1899 [.041]	18.8837 [.000]	2.9987 [.083]	30.4128 [.000]	.90569 [.341]	.85314 [.356]	4.3180 [.038]	13.8874 [.000]	18.1451 [.000]

[x] exogenous [d] endogenous Source: Data Processed

Standard errors are in parentheses. * indicates significance at 10%.

Table 6 indicates the results of error-correction model (ECM) for each variable, estimated by OLS based on cointegrating VAR (2). Given the tabulated results, we find that the LEI, LPOIL, LCOCO and LPOLEIN to be exogenous (leaders), while LRUB, LCO, LLNG, LTIN and LLATEX to be endogenous (followers). The exogenity of LEI, LPOIL, LCOCO and LPOLEIN means that they do not depend on the deviations of other variables.

The exogeneity or endogeneity of each of the variables tested are hereby tabulated in the following equations:-

$$\Delta LEI_t = \alpha_1 + \Delta LEI_{t-1+} + \Delta LEI_{t-2} + \Delta LRUB_{t-1+} + \Delta LRUB_{t-2} + \Delta LCO_{t-1+} + \Delta LCO_{t-2} + \Delta LPOIL_{t-1+} + \Delta LPOIL_{t-2} + \Delta LCOCO_{t-1+} + \Delta LCOCO_{t-2} + \Delta LLNG_{t-1+} + \Delta LLNG_{t-2} + \Delta LTIN_{t-1} + \Delta LTIN_{t-2} + \Delta LPOLEIN_{t-1+} + \Delta LPOLEIN_{t-2} + \Delta LLATEX_{t-1+} + \Delta LLATEX_{t-2} + e_{t-1}*$$

$$\Delta LRUB_t = \alpha_2 + \Delta LEI_{t-1+} + \Delta LEI_{t-2} + \Delta LRUB_{t-1+} + \Delta LRUB_{t-2} + \Delta LCO_{t-1+} + \Delta LCO_{t-2} + \Delta LPOIL_{t-1+} + \Delta LPOIL_{t-2} + \Delta LCOCO_{t-1+} + \Delta LCOCO_{t-2} + \Delta LLNG_{t-1+} + \Delta LLNG_{t-2} + \Delta LTIN_{t-1} + \Delta LTIN_{t-2} + \Delta LPOLEIN_{t-1+} + \Delta LPOLEIN_{t-2} + \Delta LLATEX_{t-1+} + \Delta LLATEX_{t-2} + e_{t-1}$$

$$\Delta LCO_t = \alpha_3 + \Delta LEI_{t-1+} + \Delta LEI_{t-2} + \Delta LRUB_{t-1+} + \Delta LRUB_{t-2} + \Delta LCO_{t-1+} + \Delta LCO_{t-2} + \Delta LPOIL_{t-1+} + \Delta LPOIL_{t-2} + \Delta LCOCO_{t-1+} + \Delta LCOCO_{t-2} + \Delta LLNG_{t-1+} + \Delta LLNG_{t-2} + \Delta LTIN_{t-1} + \Delta LTIN_{t-2} + \Delta LPOLEIN_{t-1+} + \Delta LPOLEIN_{t-2} + \Delta LLATEX_{t-1+} + \Delta LLATEX_{t-2} + e_{t-1}$$

$$\Delta LPOIL_t = \alpha_4 + \Delta LEI_{t-1} + \Delta LEI_{t-2} + \Delta LRUB_{t-1} + \Delta LRUB_{t-2} + \Delta LCO_{t-1} + \Delta LCO_{t-2} + \Delta LPOIL_{t-1} + \Delta LPOIL_{t-2} + \Delta LCOCO_{t-1} + \Delta LCOCO_{t-2} + \Delta LLNG_{t-1} + \Delta LLNG_{t-2} + \Delta LTIN_{t-1} + \Delta LTIN_{t-2} + \Delta LPOLEIN_{t-1} + \Delta LPOLEIN_{t-2} + \Delta LLATEX_{t-1} + \Delta LLATEX_{t-2} + e_{t-1}*$$

$$\Delta LCOCO_t = \alpha_5 + \Delta LEI_{t-1} + \Delta LEI_{t-2} + \Delta LRUB_{t-1} + \Delta LRUB_{t-2} + \Delta LCO_{t-1} + \Delta LCO_{t-2} + \Delta LPOIL_{t-1} + \Delta LPOIL_{t-2} + \Delta LCOCO_{t-1} + \Delta LCOCO_{t-2} + \Delta LLNG_{t-1} + \Delta LLNG_{t-2} + \Delta LTIN_{t-1} + \Delta LTIN_{t-2} + \Delta LPOLEIN_{t-1} + \Delta LPOLEIN_{t-2} + \Delta LLATEX_{t-1} + \Delta LLATEX_{t-2} + e_{t-1}*$$

$$\Delta LLNG_t = \alpha_6 + \Delta LEI_{t-1} + \Delta LEI_{t-2} + \Delta LRUB_{t-1} + \Delta LRUB_{t-2} + \Delta LCO_{t-1} + \Delta LCO_{t-2} + \Delta LPOIL_{t-1} + \Delta LPOIL_{t-2} + \Delta LCOCO_{t-1} + \Delta LCOCO_{t-2} + \Delta LLNG_{t-1} + \Delta LLNG_{t-2} + \Delta LTIN_{t-1} + \Delta LTIN_{t-2} + \Delta LPOLEIN_{t-1} + \Delta LPOLEIN_{t-2} + \Delta LLATEX_{t-1} + \Delta LLATEX_{t-2} + e_{t-1}$$

$$\Delta LTIN_t = \alpha_7 + \Delta LEI_{t-1} + \Delta LEI_{t-2} + \Delta LRUB_{t-1} + \Delta LRUB_{t-2} + \Delta LCO_{t-1} + \Delta LCO_{t-2} + \Delta LPOIL_{t-1} + \Delta LPOIL_{t-2} + \Delta LCOCO_{t-1} + \Delta LCOCO_{t-2} + \Delta LLNG_{t-1} + \Delta LLNG_{t-2} + \Delta LTIN_{t-1} + \Delta LTIN_{t-2} + \Delta LPOLEIN_{t-1} + \Delta LPOLEIN_{t-2} + \Delta LLATEX_{t-1} + \Delta LLATEX_{t-2} + e_{t-1}$$

$$\Delta LPOLEIN_t = \alpha_8 + \Delta LEI_{t-1} + \Delta LEI_{t-2} + \Delta LRUB_{t-1} + \Delta LRUB_{t-2} + \Delta LCO_{t-1} + \Delta LCO_{t-2} + \Delta LPOIL_{t-1} + \Delta LPOIL_{t-2} + \Delta LCOCO_{t-1} + \Delta LCOCO_{t-2} + \Delta LLNG_{t-1} + \Delta LLNG_{t-2} + \Delta LTIN_{t-1} + \Delta LTIN_{t-2} + \Delta LPOLEIN_{t-1} + \Delta LPOLEIN_{t-2} + \Delta LLATEX_{t-1} + \Delta LLATEX_{t-2} + e_{t-1}*$$

$$\Delta LLATEX_t = \alpha_9 + \Delta LEI_{t-1} + \Delta LEI_{t-2} + \Delta LRUB_{t-1} + \Delta LRUB_{t-2} + \Delta LCO_{t-1} + \Delta LCO_{t-2} + \Delta LPOIL_{t-1} + \Delta LPOIL_{t-2} + \Delta LCOCO_{t-1} + \Delta LCOCO_{t-2} + \Delta LLNG_{t-1} + \Delta LLNG_{t-2} + \Delta LTIN_{t-1} + \Delta LTIN_{t-2} + \Delta LPOLEIN_{t-1} + \Delta LPOLEIN_{t-2} + \Delta LLATEX_{t-1} + \Delta LLATEX_{t-2} + e_{t-1}$$

It is worth highlighting that the above finding shows an interesting observation where the FTSE Bursa Emas Shariah Index is in fact a leading variable towards most of the commodities. Intuitively, this should not have been the case, as the financial sector should not ideally drive the real sector unless financialization took place. On the other hand, it should be the real sector -- that is the commodities market, which leads the equity market. Based on this, we can infer that the finding has been counter-intuitive to our earlier expectation, i.e. the Islamic equity leading the real sector, perhaps implying that financialization also exists in the Islamic equity market.

Furthermore, our expectation based on Islamic principle is to find Palm Oil and Cocoa as exogenous commodities, including Palm Olein. This observation supports our proposition that these three commodities which represent the factors in the real economy, i.e. their prices are very much dependent on the actual transactions of the underlying commodities. However, we note that out of the three commodities, only the Palm Olein that is found to be both exogenous and cointegrated with the Islamic equity. Meanwhile, the remaining commodities (Rubber, Crude Oil, Natural Gas, Tin, and LATEX), were found to be endogenous, implying that perhaps investors need to carefully manage their portfolio risk, should their basket of portfolio consists any of these commodities.

To conclude, another policy implication perhaps would be for the regulator to reassess the framework of Islamic stock market to reflect the ideal Islamic financial intermediation role, i.e. to serve and not to be decoupled from the real sector. This observation comes to no surprise as Islamic stock market has been treated as a subset of the conventional where the rules of behaviour (or market conduct) of both markets are exactly the same.

STEP 6: Variance Decompositions

Despite the value-adding information from the previous stage, a measure of relative exogeneity of the variables through decomposing the variance is deemed to offer richer information and insights for policy makers, i.e. the regulators and investors, so as to enhance the effectiveness of their policy-making. Variance decomposition technique decomposes the variance of the forecast error of a particular variable into proportions attributable to shocks in each variable in the system, including its own. Hence, a variable which is explained mostly by its own shocks is deemed to be the most exogenous, while a variable which is least explained by its own shocks is deemed to be the least exogeneous (or most endogenous) of them all.

In this step, there are two types of VDCs; orthogonalized VDCs and generalized VDCs. Orthogonalized VDCs are sensitive to the ordering of the variable in the VAR and assume all other variables to be switched-off (that is, constant) when one-specific variable is shocked. As such, this type of test is seen to be less realistic compared to Generalized VDCs. Generalized VDCs are not dependent upon the particular-ordering

of the variables in the VAR, and allow other variables to change when a variable is shocked.

It can be deduced from Table 7 that Natural Gas (LNG), Tin (LTIN), and FTSE Bursa Emas *Shari'ah* Index (LEI) are the top three of most exogenous variables, while Crude Oil (LCO), Rubber (LRUB), and Latex (LLATEX) are the least exogenous variables (or the endogenous variable). Except for FTSE Bursa Emas *Shari'ah* Index (LEI), the result seems to be contradictory with VECM result which suggests Natural Gas (LNG) and Tin (LTIN) to be endogenous variables. Moreover, Palm Oil (LPOIL), Palm Olein (LPOLEIN) and Cocoa (LCOCO), which are expected to be exogenous variables as in VECM result, are fail to attenuate the exogeneity expectation. Rather, these commodities rank become number 4,5, and 6, varying according the horizon. However, the result for Crude Oil (LCO), Latex (LLATEX), and Rubber (LRUB), are known to be equal like with VECM.

Table 7: Generalized VDCs

Horizon:	Percentage of Forecast Variance Explained by Innovations in:								
Monthly	LEI	LRUB	LCO	LPOIL	LCOCO	LLNG	LTIN	LPOLEIN	LLATEX
Relative Variance in LEI (Rank:3)									
6	0.411	0.055	0.16	0.153	0.001	0.008	0.013	0.125	0.073
18	0.400	0.053	0.164	0.155	0.002	0.008	0.017	0.123	0.077
36	0.398	0.052	0.164	0.155	0.002	0.009	0.018	0.122	0.078
Relative Variance in LRUB (Rank: 8 at Horizon 6 &18; 9 at Horizon 36)									
6	0.149	0.215	0.065	0.188	0.006	0.0156	0.0026	0.221	0.136
18	0.158	0.197	0.063	0.196	0.004	0.016	0.002	0.232	0.130
36	0.159	0.193	0.063	0.198	0.003	0.017	0.002	0.234	0.129
Relative Variance in LCO (Rank: 7)									
6	0.213	0.044	0.235	0.217	0.004	0.006	0.0007	0.251	0.029
18	0.218	0.043	0.216	0.223	0.003	0.006	0.0002	0.259	0.031
36	0.219	0.042	0.212	0.224	0.002	0.007	0.0001	0.260	0.032
Relative Variance in LPOIL (Rank: 6 at Horizon 6 and 18; 5 at Horizon 36)									
6	0.130	0.05	0.05	0.32	0.007	0.008	0.015	0.326	0.097
18	0.132	0.047	0.045	0.32	0.006	0.008	0.015	0.327	0.099
36	0.132	0.047	0.045	0.319	0.006	0.009	0.015	0.326	0.100
Relative Variance in LCOCO (Rank: 4 at Horizon 6; 5 at Horizon 18; 6 at Horizon 36)									
6	0.050	0.070	0.053	0.176	0.374	0.008	0.016	0.182	0.069
18	0.059	0.069	0.055	0.191	0.328	0.0103	0.014	0.199	0.074
36	0.060	0.069	0.055	0.195	0.318	0.010	0.014	0.203	0.075
Relative Variance in LNG (Rank:1*)									

6	0.028	0.003	0.003	0.001	0.024	0.867	0.053	0.005	0.015
18	0.036	0.003	0.002	0.0005	0.033	0.837	0.065	0.005	0.016
36	0.038	0.003	0.002	0.0003	0.036	0.829	0.067	0.005	0.017
Relative Variance in LTIN (Rank:2)									
6	0.014	0.007	0.042	0.056	0.035	0.005	0.762	0.072	0.006
18	0.0232	0.0067	0.054	0.073	0.031	0.006	0.703	0.098	0.005
36	0.026	0.006	0.058	0.078	0.029	0.007	0.684	0.106	0.004
Relative Variance in LPOLEIN (Rank:5 at Horizon 6; 4 at Horizon 18 and 36)									
6	0.119	0.037	0.046	0.319	0.006	0.007	0.016	0.365	0.083
18	0.124	0.035	0.043	0.32	0.005	0.008	0.016	0.364	0.085
36	0.122	0.035	0.043	0.319	0.005	0.008	0.016	0.364	0.086
Relative Variance in LLATEX (Rank: 9 at Horizon 6&18; 8 at Horizon 36)									
6	0.143	0.187	0.022	0.192	0.006	0.014	0.016	0.207	0.211
18	0.153	0.174	0.022	0.198	0.004	0.014	0.018	0.219	0.196
36	0.156	0.171	0.022	0.200	0.0035	0.014	0.017	0.222	0.193

As implied in Table 7, variables movements are known to be varied according to the time-horizon. We called this behaviour of commodities as dynamic relationship. Despite contradictory with VECM, this result is indeed intuitive and sensible as the movement of the commodities is *perhaps* due to the active market condition of the commodities. Besides, VECM test uses error term of the model to assign the absolute endogeneity, whilst VDC decomposes variance into different time-horizon.

For instance, Natural Gas and Tin are known to be endogenous, yet are evidenced to be the most exogenous within horizon 6, 18, and 36 months. This suggests that the prices of these commodities are being explained by self-affected movement (not affected by others) and is in line with our earlier expectation that commodities should be the leading variables. Meanwhile, the leading commodities in VECM, namely Palm Oil (LPOIL), Palm Olein (LPOLEIN), and Cocoa (LCOCO), are shown to be the most affected by others. This result confirms the dynamic behaviour of assets in the market within the short horizon, in particular the commodity. This therefore suggests an important insight to investors that portfolio diversification and hedging strategy do change over time. Hence, investors will need to shall carefully choose which commodity that suits their time-horizon.

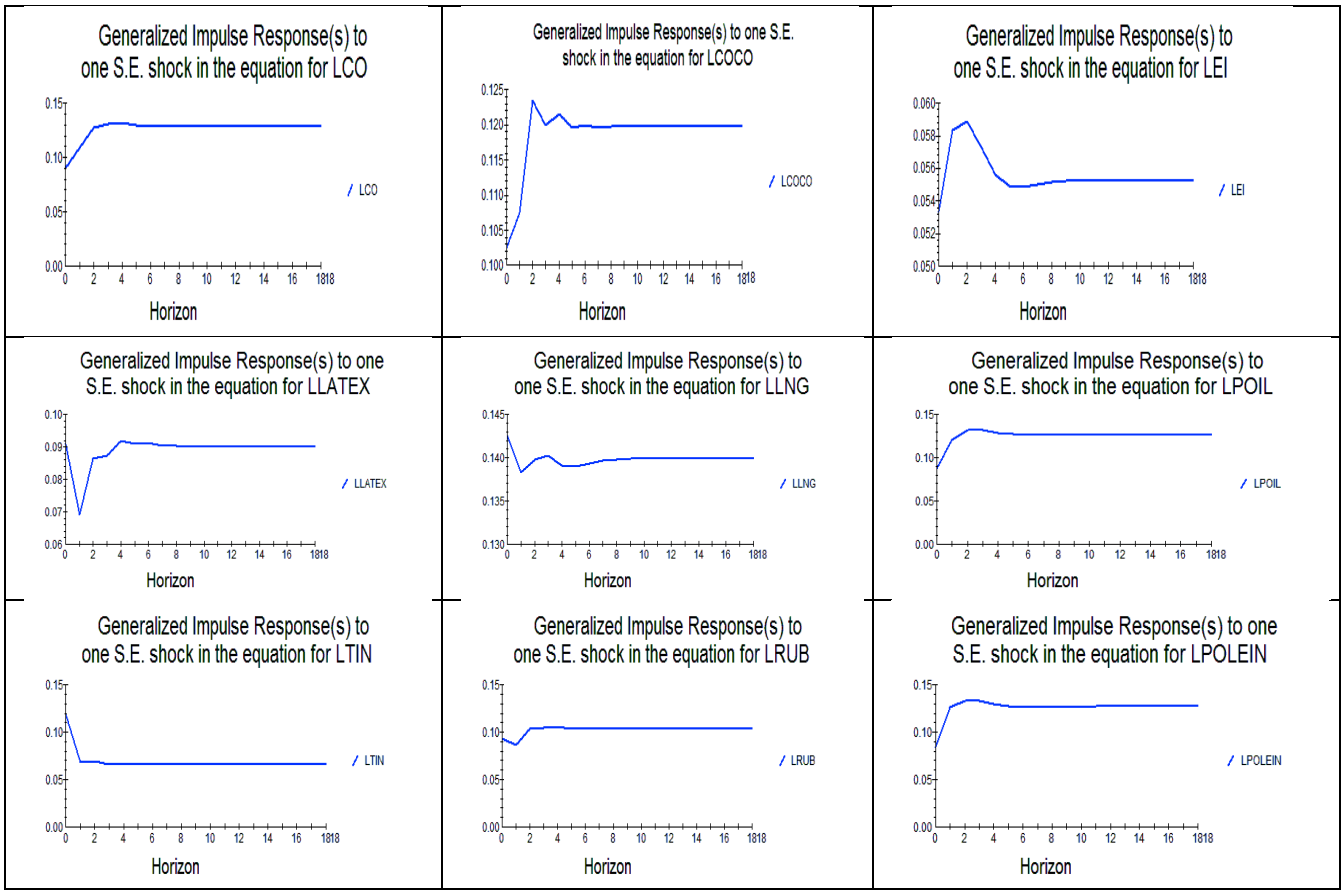
STEP 7: Impulse Response Function

The information contained in the VDCs can be equally represented by the impulse response functions (IRFs), which are graphical illustrations of the dynamic

response of a variable owing to one-period standard deviation shock to another variable. In an IRF graph, zero represents the steady-state (equilibrium) value of the response variable; hence demonstrating the speed of adjustment of the variable had a shock is given to certain variable. Therefore, besides the same policy implication as it is in the VDC, IRFs also provide insightful information of speed of adjustment to policy makers.

It can be inferred from IRF graphs that the fastest commodity (variable) returning to equilibrium is Tin (2.7 months), followed by Rubber (4.5 months), Latex (4.8 months), Palm Oil (5 months), Cocoa (8 months), Natural Gas (9 months), and Palm Olein (11 months). As for the FTSE Bursa Emas *Shari'ah* Index, it is evidenced that it takes 5 months for the Index to return to equilibrium had there been an external factor shocks the Index. Knowing this, investors could diversify their portfolio based on the commodities' respective speed of adjustment. In line with previous discussion, the faster the commodities returned to the equilibrium, that is exogenous, the better it is for investors to invest in the commodity.

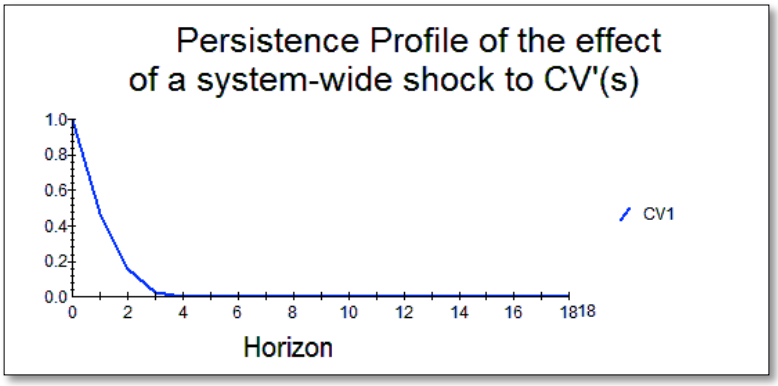
Figure 1: Generalized IRFs



STEP 8: Persistence Profile

While the above illustrations of IRFs map out the response to variable-specific shocks, the persistence profile traces out the effects of a system-wide shock on the long-run relationship of the variables. In particular, it shows that it could take up to about 4 months to restore equilibrium in the economy following an external shock to the cointegrating relationship.

Figure 2: Persistence Profile



5.0. Conclusion and Recommendation

This paper is a modest attempt for an empirical analysis of Malaysian Islamic equity market to see its linkage to the real economic variables, namely the primary export commodities of Malaysia. Despite evidencing the existence of cointegrating relationships, the study has also empirically demonstrated that not all commodities are exogenous to equity, in particular to Islamic equity. In addition, Islamic equity is proven to be consistently exogenous in both VECM and VDC methods. This finding ran counter-intuitive to our expectation where Islamic equity would ideally be closely linked with the real sector, to be represented by its endogeneity vis-à-vis commodity variables. Recognizing the limitation of the tools to answer the research questions, this finding *could only* confirm the prevailing perception that Islamic equity is a subset market of the conventional capital market. In that,

this means the Islamic equity is behaving the same way as its conventional counterpart, i.e. independent without any influence from other variables, in this case the commodities in Malaysia.

Besides contributing to the literature, this study also provides insightful information for investors about the behaviour of the commodities. Palm Oil and Cocoa are proven to be not cointegrated with the Islamic equity, hence from the conventional finance's perspective, these two commodities offer the benefits of diversification and hedging. In terms of causality however, the commodities behave differently in VECM and VDC results. The findings, therefore, suggest that the commodities are dynamic, where their causality relationship between one another could vary depending on time horizon. Based on this insight, in order to gain optimal benefits of portfolio diversification, investors should choose the most appropriate commodities according to the preferred investment time horizon.

5.1. Suggestion for Future Research

This elemental study exhibits some limitations which could provide area for future research. One important limitation is the selection of the variables which is restricted to the commodities, which may not accurately represent the real economic sector of Malaysia. It would be interesting to retest the same with the inclusion of the other sectors that have larger contribution to the growth of the economy such as telecommunications and construction.

References

Bailey, O. (2010). Developments in Emerging Equity Markets. *Reserve Bank of Australia Bulletin*, December Quarter.

Engle, R..and Granger, C. (1987). Cointegration and error-correction representation, estimation, and testing, *Econometrica*, 55(2), 251–276.

Fahami, N. (2011). The Structure of Linkages and Causal Relationship Between BRIC and Developed Equity Markets, in *International conference on information and finance*, IPEDR, 21, 72-77

Hadi, A. (2011). Investigating Relationship Between Crude Palm Oil and Crude Oil Prices - Cointegration Approach. *2nd International Conference on Business and Economic Research*, 2nd ICBER 2011 Proceeding. March, Number 2011 – 281.

Hussin, M. (2012). The Relationship between Oil Price, Exchange Rate and Islamic Stock Market in Malaysia. *Research Journal of Finance and Accounting*. 3(5), 83-92.

Longin, F and Solnik, B (2001). Extreme Correlation of International Equity Markets. *Journal of Finance.*56(2), 649-676

Ong, T.S. (2012). Hedging Effectiveness of Crude Palm Oil Futures Market in Malaysia*. World Applied Sciences Journal,* 19 (4). 556 -565.

Rossi, B. (2012). The Changing Relationship Between Commodity Prices and Equity Prices in Commodity Exporting Countries, *IMF Economic Review*, 60(4), 533 -569.

Saad, N.(2013). Performance of Crude Palm Oil and Crude Palm Kernel Oil Futures in Malaysian Derivatives Market. *Journal of Business and Management*, 2(1), 26 -33

Tang, K and Xiong, X (2012). Index Investment and the Financialization of Commodities. *Financial Analyst Journal.* 68(6), 54 -74

UNCTAD (2012). Don't Blame the Physical Markets: Financialization is the Root Cause of Oil and Commodity Price Volatility. Policy Brief No. 25, September 2012.

Yusuf, M and Rahman, H (2013). Granger Causality Relationship between Malaysia Equity Market and Exchange rate Volatility. *International Journal of Trade, Economics and Finance,* 4(1), 19 -24.